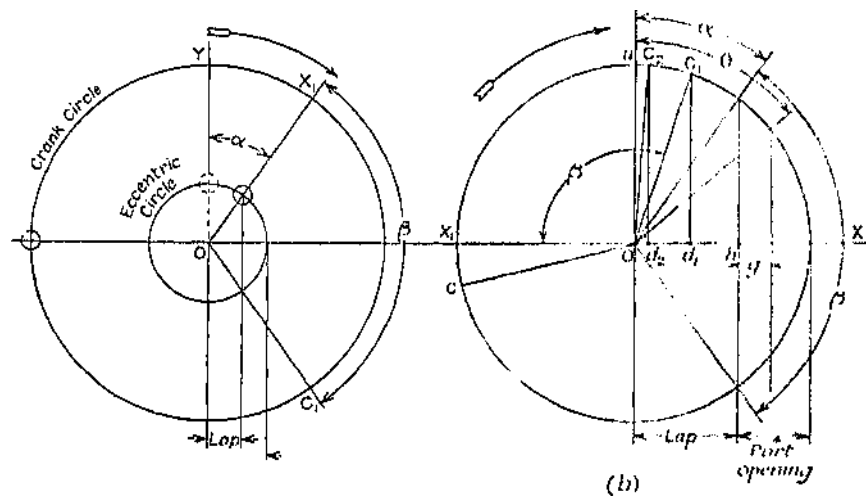


# THE RECIPROCATING STEAM-ENGINE

at the same time that the piston would be at mid-stroke, neglecting the obliquity of the connecting-rod, so that by the time the piston had arrived at the right-hand end of the cylinder, the valve would have returned to its central position. It would continue to move to the left, and would thus open the right-hand port to steam and the left-hand port to exhaust, and the piston would move from right to left, and so on continuously. It will be seen, therefore, that the valve travels from mid-position by a distance equal to the port opening, and that when it is in mid-position the piston is at one end or other of its stroke, and vice versa.

A little consideration will show that the crank or eccentric driving the valve must lead the main crank by  $90^\circ$  in the direction of rotation, as shown



(a) Port opening

Fig. 15,—Valve Diagrams

by the arrow (fig. 15 a), while the time occupied for the complete opening and closing of the port, or, in other words, the *period of admission*, is just equal to the time taken by the piston to make one stroke, or while the crank is passing through  $180^\circ$ , the steam being admitted during the whole of that period. This is, of course, wasteful, as the expansive force of the steam is not used. To obtain expansive working the steam must be cut off from the cylinder at some point before the piston has completed its stroke. This is done very simply.

The valve is made longer at each end so that it overlaps the outer edges of the steam ports, as shown by the dotted lines in fig. 14, and in order that the port shall be opened at the same instant as before, that is, just when the piston is commencing its stroke, the eccentric must be moved forward on the shaft in the direction of rotation through an angle  $\alpha$  which would give a movement *equal to* the lap. This is called the *angle of advance*, and is obtained by setting off the lap from O (fig. 15  $\angle \alpha$ ), and drawing upward the perpendicular to cut the valve circle. The period of opening and closing, or of admission, is now the angle  $\angle \theta$ , found by producing